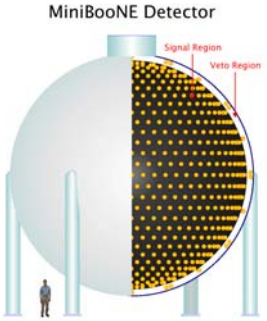
MiniBooNE at Fermilab



Status of Oil Measurements for Fall 2004 Baseline

Bruce C. Brown, Fermilab

MiniBooNE Collaboration Mtg

November 3, 2004

Status of Oil Measurements for Fall 2004 Baseline

Results in Hand:

Extinction Measurements

Small Errors at Short Wavelengths (<310 nm)
Not-so-small Errors at Longer Wavelengths (>310 nm)

Scattering Measurements

Absolute Rate of Rayleigh Scattering confirmed
at two wavelengths with polarized measurements

Angular Dependence for Rayleigh Scattering confirmed at two wavelengths. Polarization allows separation into components due to isotropic and anisotropic density fluctuations.

Wavelength Dependence confirmed with Spectrofluormeter Study.

Raman Scattering (small effect) observed in Spectrofluormenter.

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Status of Oil Measurements for Fall 2004 Baseline

Results in Hand (continued):

Fluorescence Measurements

Excitation-Emission Matrix Analyzed with SVD
to provide characteristics of 4 dominant fluors.

Normalization using para-terphenyl gives absolute absorption per emitted photon. Comparison to extinction determines fluorescence quantum yield. FNAL results consistent (within errors).

Time Resolved Measurements provide emission spectra and time constants for 5 fluorescent components.

Presentation

Results presented as poster at NSS04 in Rome and 5 page paper submitted to Conference Proceedings

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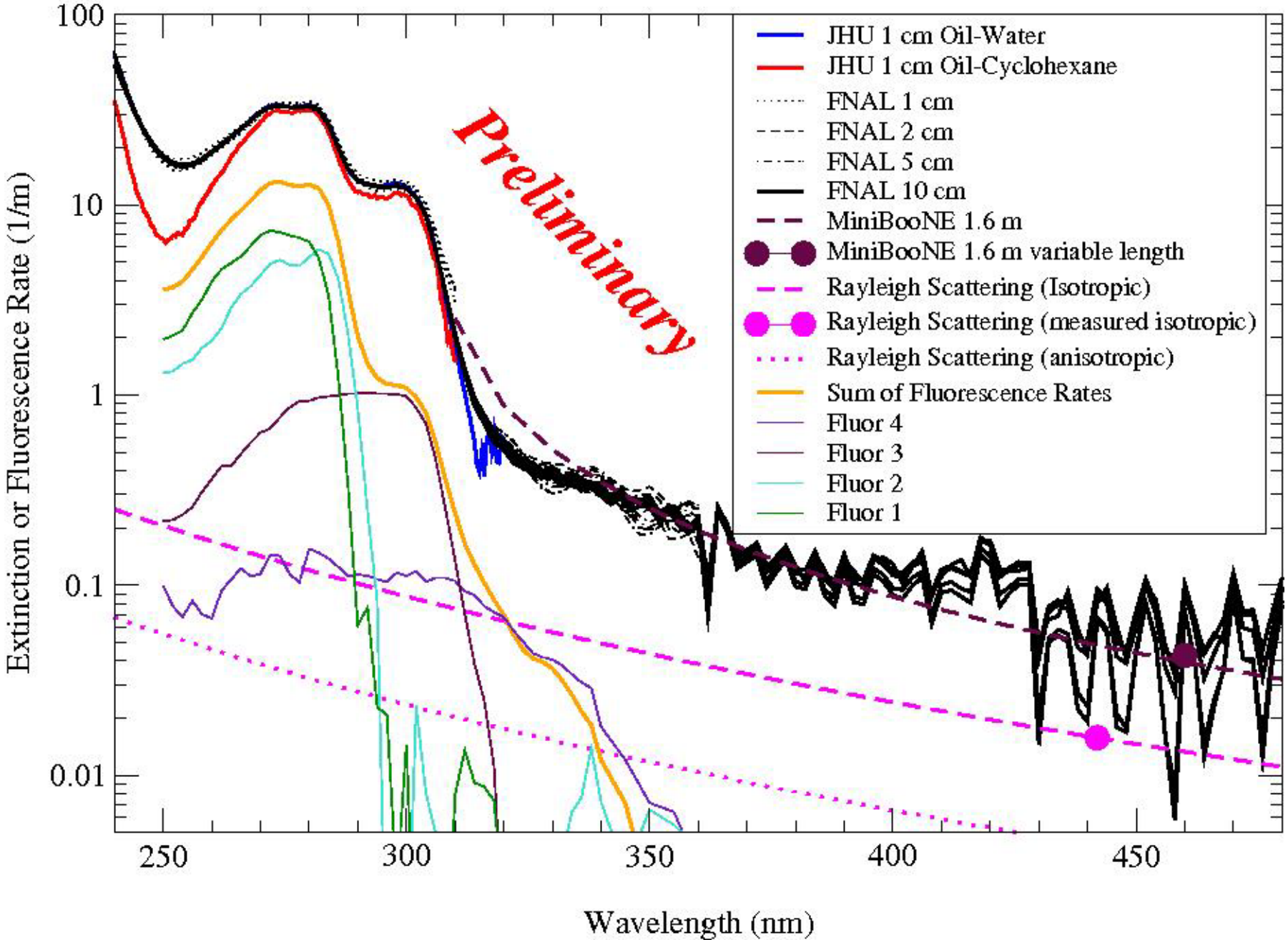
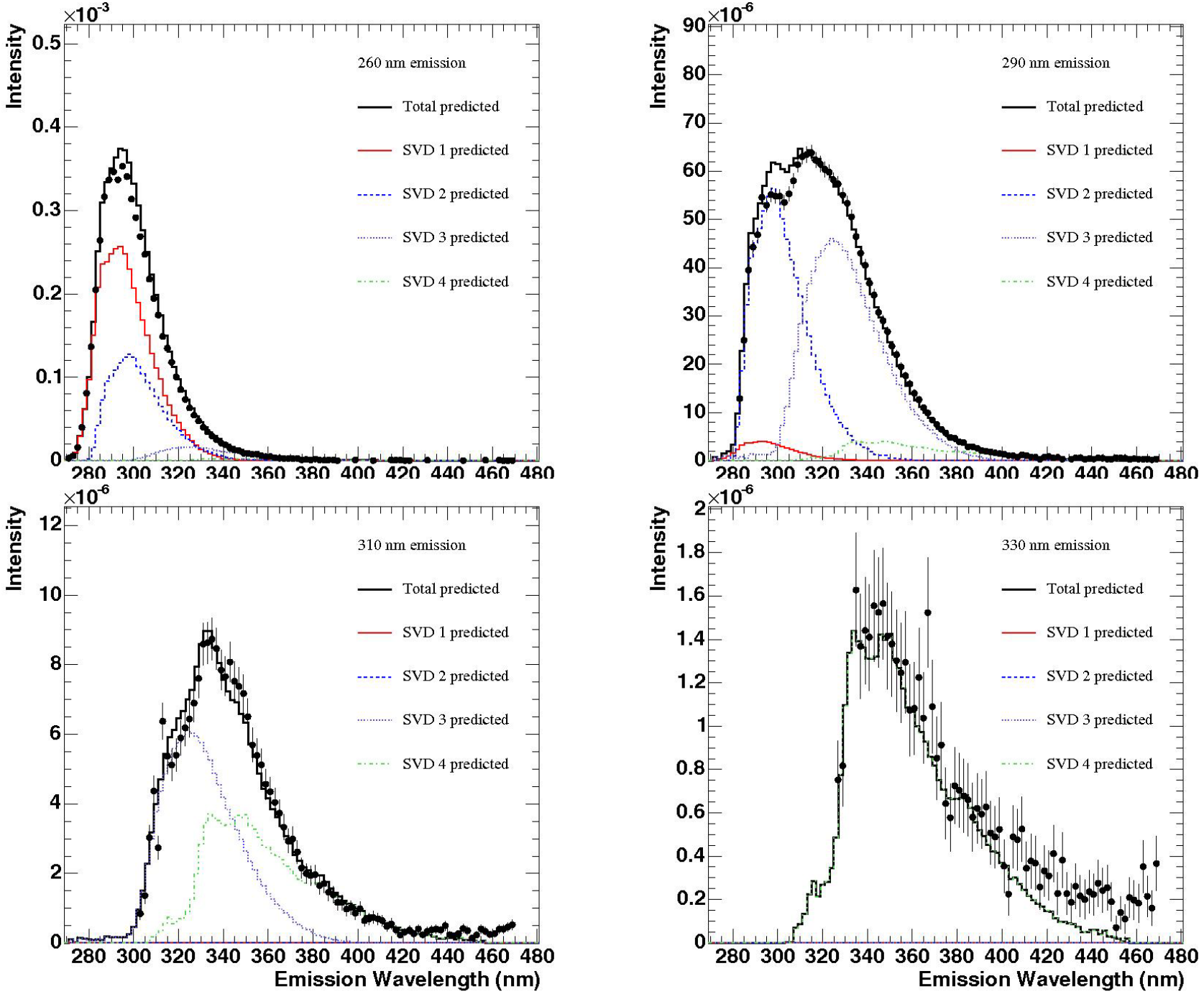
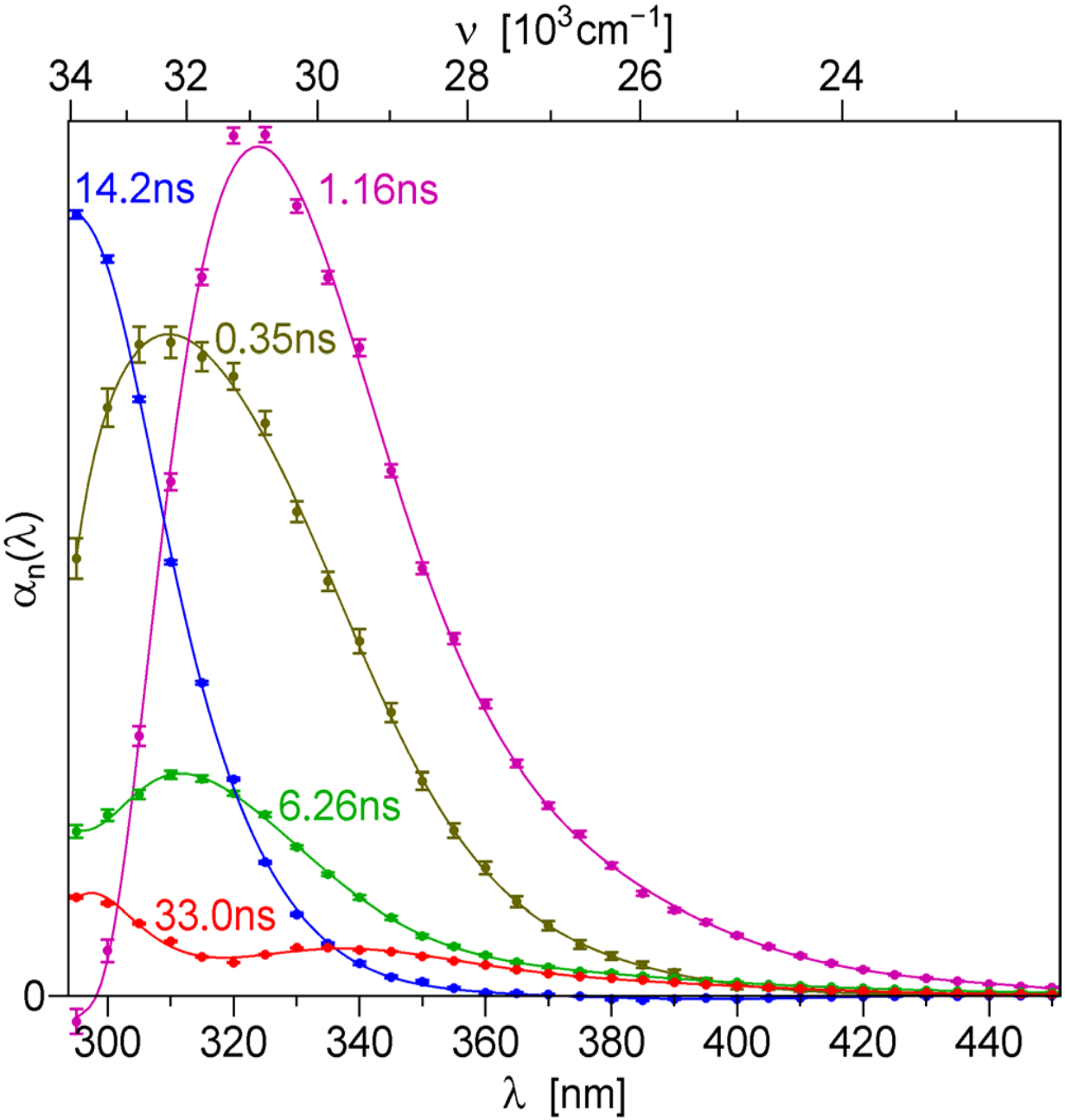
Extinction Rate for MiniBooNE Marcol 7 Mineral Oil




260 nm emission
290 nm emission
310 nm emission
330 nm emission
Total predicted
SVD 1 predicted
SVD 2 predicted
SVD 3 predicted
SVD 4 predicted
Intensity
Emission Wavelength (nm)



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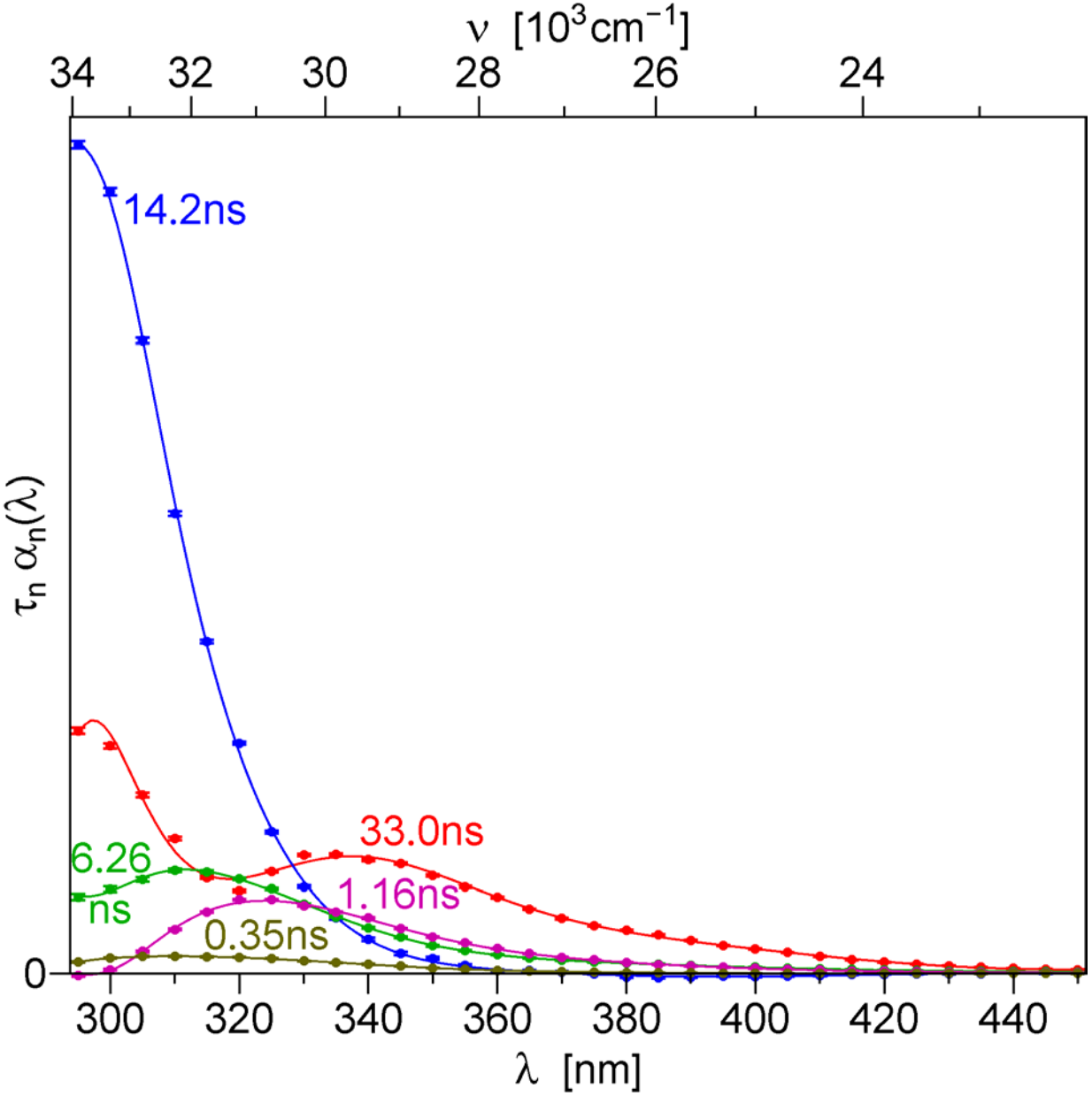

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Status of Oil Measurements for Fall 2004 Baseline

Issues to Resolve (or at least consider):

Absorption

Is difference between scattering and extinction due to absorption, i.e. do the photons disappear from the observable spectrum?

Index of Refraction

Does the fluorescence or other atomic processes produce pole in the dielectric properties which provides a cutoff in the production of Cherenkov Light?

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Oil Measurements Beyond Fall 2004 Baseline

Details for Further Study:

Extinction

Consider additional measurements with 10 cm samples.
Access to additional measurement systems may be possible.
Extract error bars for measurements for final results.

Fluorescence

Is there a fluorescence contribution to extinction above 330 nm? What are our error bars? Are further measurements useful?

Fermilab system accesses fluorescence 190 – 250 nm where SVD input was not provided. Is this region important?

Latest time resolved measurements were intended to provide a definitive results on time constants. Instead the results were not fully consistent.

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Oil Measurements Beyond Fall 2004 Baseline

Details for Further Study:

Chemistry (at BNL)

May be able to distill some oil and measure effect on optical properties.

Fluorescence

Can we identify additional of the fluors we are observing?

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